SYSTRON DONNER

A THORN EMI company

SYSTRON DONNER
Member THORN EMI Group

MODEL VPH1-40 S7021

INSTRUMENT DIVISION

OPERATING AND SERVICE MANUAL

The VPH1-40 S7021 Power Supply is similar to the VPH5-60MOV as described in the enclosed manual with Special Modification S7021 added.

Special Modification S7021 consist of:

1. Input volts to 208,220,230 and 235 Vac ±10% @50/60 Hz.
2. Temperature Range: 25 - 50° C.
3. Output Volts: 1.0 to 1.5V. Set to 1.0V.
4. Output Amps: 40A.
5. Overvoltage set to: 3.0V.
6. Overload Protection set to: 46A Maximum.
7. See Parts Lists 065132-91.
8. See Schematic D065058 for circuit description.

2727 Systron Drive • Concord, California 94518 • U.S.A.
Tel: (415) 676-5000 • TWX: 910-481-9479 • Cable: SYSTRON DONNER
FSCM No. 52542

Copyright © 1982 Systron Donner
Printed in U.S.A.

✳ - INDICATES DEVIATION FROM STANDARD VPH 5-60-MOV

ITEM NO.	MFG'R CODE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
1		065132	SHIPPING ASS'Y., VPH 5-60 OV		X	2		
5	E		SCHEMATIC, OV	D065058	1	R		
6			SPECIAL TEST DATA	1302	1	R		
9	B	PD27856	ASS'Y., TOP COVER & LABEL		1	2		
10	C	118184	COVER, FINISHED		1	1		
11		065148	AC - COVER		1	2		
12		840180	ROUND SPACER		2	1		
13		780960	NAMEPLATE		1	1		
14		[illegible]						
15		840405	PLUG BUTTON		1	1		
17	B	PD27849	ASS'Y., CHASSIS * 1		1	2		
18	C	123924	CHASSIS, FINISHED		1	2		
21		840130	FEET, RUBBER		4	1		
23		820371	CAPACITOR, 25000µF, 25V	C105, 106, 109	3	1		
25		820274	↓ , 6000µF, 40V	C107	1	1		
27		106664	FAN	B101	1	1		
29		T300080	CLAMP, CAPACITOR		1	1		
31		100725	↓		1	1		
33	C	118192	↓		1	1		

REVISIONS

REV	DESCRIPTION

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT
				52642

PLANNER | PREP DATE 10-22-75 | CHK'D | APP'D | MAT. DUE | B/U REQ. | B/U COMP | USED ON

SYSTRON DONNER CORPORATION

SHIPPING ASS'Y

VPH 1-40-S7021

DRAWING NO.

REF	SIZE	PART NO.	REV
—	P	035[illegible]-911	

SHEET 1 OF 8

FORM E8-A 11 JUL 75

*- INDICATES DEVIATION FROM STANDARD VPH5-60-MOV

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
		PD02499 6	ASS'Y., CHASSIS # 1 (CONT)		—	—		
35	C	118212	BRKT, MTG., XFMR & CHOKE		1	2		
36		790520	FUSE LABEL 5 AMP S.B.		1	1		
37		T9101110	GROMMET		1	1		
41	A	PD025173	ASS'Y., HEATSINK # 2		1	2		
42	C	118982	HEATSINK, ADDITION # 1		1	2		
43		7050711	TRANSISTOR	Q101 & 102	2	1		
44		7001196	↓	Q103	1	1		
45		8301101	SOCKET, TRANSISTOR		2	1		
46		830103	↓ ↓		1	1		
47		T9902930	WASHER, MICA		2	1		
48		T9902855	↓ ↓		1	1		
49		8590119	STRIP, TERMINAL		1	1		
50		T9100610	GROMMET 3/16		1	1		
51	C	119112	PLATE, FAN, RIGHT		1	2		
52	C	119122	↓ , ↓ , LEFT		1	2		
53		T9501714	INSULATION, RUBBER		1	1		
54								
55	F	PD027843	REAR CHASSIS ASS'Y		1	2		
56	E	123832	BKT-TERM STRIP		1	2		
57		8402000	HOLDER, FUSE		1	1		
58		5701138	FUSE, 5A, 250V	F1	1	1		
59		8501330	STRIP, BARRIER	TB1	1	1		
60		118242	BLOCK, INSULATOR	TB2	1	2		
61		8500552	STRIP, BARRIER	TB3	1	1		
62		840217	LINK, BARRIER STRIP		1	1		
63		8500361	BARRIER STRIP	TB4	1	1		
64	B	PD025010	ASS'Y., CHASSIS # 2		1	2		
65		504311	TRANSFORMER	T101	1	2		

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT 52542
PLANNER	PPEP DATE 10-23-75	SYSTRON DONNER CORPORATION		
	CHK'D	SHIPPING ASS'Y		
MAT. DUE	APP'D	VPH1-40-S7021		
B/U REQ.		DRAWING NO.		
B/U COMP	USED ON	REF — SIZE P PART NO. 065132	REV	
		SHEET 2 OF 8		

REVISIONS DESCRIPTION REV

FORM E8-A 11 JUL 75

*-INDICATES DEVIATION FROM STANDARD VPH 5-60-MOV

ITEM NO.	SYM	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
		PD025010 (CONT)	ASSLY, CHASSIS #2		X	-		
67		*504125	CHOKE	L101	1	2		
68	B	118222	BAR, BUSS, POS. OUTPUT		1	2		
69		118232	" " NEG. "		1	2		
70	B	118292	SHUNT 2.4 mΩ	R117	1	2		
72	A	PD27847	ASSLY, FRONT PANEL		1	2		
73	C	118284	FRONT PANEL PIN		1	2		
74		750096	METER 0-50A	M101	1	1		
75		0650370	—•— 0-4V	M102	1	R		
76		880611	SWITCH	S101	1	1		
77			DELETE	DS1101	1	1		
78		600140	RES., V ADJ. 500-2W	R116	1	1		
79		C85420	OUTPUT LABEL	PD27857	1	1		
80	A	PD25175	HEAT SINK ASSY & WIRING		1	2		
81		118992	H. SINK ADDITION		1	2		
R3	B	PD27851	HEAT SINK ASSY & WIRING		1	2		
84		640190	RES. 10Ω 2W	R115	1	1		
85		630029	" .15Ω 5W	R104 + R105	10	1		
87	B	PD25007	ASSLY, HEAT SINK O.V.		1	2		
88		T115802	HEAT SINK, FAB		1	2		
89		118612	BRKT, PC SUPPORT		2	2		
90		118602	BAR, BUSS, EMITTER		1	2		
91		799041 5	NUT, PUSH, NYLON		3	1		
92		799040 5	" " "		2	1		

REVISIONS

REV	DESCRIPTION

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT 52542
PLANNER	PREP DATE	SYSTRON DONNER CORPORATION		
MAT. DUE	CHK'D	SHIPPING ASSLY		
B/U REQ.	APP'D	VPH 1-40-57021		
B/U COMP	USED ON	DRAWING NO. REF — SIZE P PART NO. 06532 REV		
		SHEET 3 OF 8		

FORM ER-A 11 JUL 75

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
		PD250877 (REV 7)	ASS'Y., HEATSINK		-	-		
99		T960347	RIVET		4	1		
01		700401	TRANSISTOR, 2N3771	Q104-113	10	1		
03		720132	DIODE	CR108	1	1		
05		720129		CR107	1	1		
07		720486		CR105 & 104	2	1		
09		8301101	SOCKET, TRANSISTOR		10	1		
11		T990350	RING, INSULATOR		1	1		
13		T990307	WASHER, MICA		2	1		
15		T960085	LUG, SOLDER.		1	1		
17		3800038	SWITCH, THERMAL.	S102	1	1		
19								
21		720209	DIODE - SCR	CR106	1	1		
23		T990340	RING, INSULATOR.		3	1		
25		T990295	WASHER, MICA		2	1		
27		T960640	LUG		1	1		
29	C	1191132	PLATE, DEFLECTOR		1	2		

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT
				52542

PLANNER	PREP DATE	SYSTRON DONNER CORPORATION
	10-23-75	
	CHK'D	SHIPPING ASS'Y
MAT. DUE	APP'D	VPH 1-40-S-7021
B/U REQ.		DRAWING NO.
B/U COMP	USED ON	REF — SIZE P — PART NO. 065132 — REV
		SHEET 4 OF 5

REV. DESCRIPTION

FORM E8-A 11 JUL 75

✳ - INDICATES DEVIATION FROM STANDARD VPH 5-60-MOV

ITEM NO.	SIZE	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
		PD02501 (CONT)	ASS'Y., CHASSIS #2		--	-		
313		122852	STRIP, OUTPUT HOLDING		1	2		
330		PD27845	ASS'Y., COMP. BD.		1	2		
350		T112256	FAB., P.C.B		1	2		
360			ARTWORK	112256	REF	-		
37		T960464	TERMINAL		16	1		
38		543131	✳ RIGHT ANGLE		16	1		
						.		
41		810132	CAPACITOR, 100μF, 50V	C1	1	1		
						.		
43		800090	.01μF, 600V	C3	1	1		
44		800082	470pF, ↑	C4	1	1		
45		810060	35μF, 25V	C5	1	1		
46			S/AC5	C6	1	1		
47		800168	.05μF, 200V	C7	1	1		
48			S/AC3	C8	1	1		
49		800176	.1μF, 100V	C9	1	1		
51		810161	200μF, 25V	C11	1	1		
52		100063	10μF 25V	C12	1	1		
53		810161	↑ 200μF ↓	C13	1	1		
55		100413	DIODE, IN4004	CR1	2	1		
56			S/A CR1	CR2				
57		720410	IN4741A	CR4	1	1		
58		100387	IN753A	CR4	1	1		
59			DELETE	CR5				
60		720384	IN4384	CR6	4	1		
61			↑ S/A CR6	CR7				

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT
				52542

PLANNER	PREP DATE	SYSTRON DONNER CORPORATION
	10-23-75	
	CHK'D	SHIPPING ASS'Y
MAT. DUE	APP'D	
		VPH 1-40-S7021
B/U REQ.		DRAWING NO.
		REF — SIZE P PART NO. 065132 REV
B/U COMP	USED ON	SHEET 5 OF 8

REVISIONS

REV	DESCRIPTION

*- INDICATES DEVIATION FROM STANDARD VPH5-60-MOV

ITEM NO.	SI	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
		PD27645 (CONT)	ASS'Y, COMP. B.D.		-			
163		720331	DIODE, IN4331	CR8	1	1		
164		741001	UN-SW 2N4990	CR9	1	1		
166		720440	IN 4148	CR11	1	1		
167			S/A CR6	CR12				
168				CR13				
170		025756	I.C.	A1	1	1		
172		705068	TRANSISTOR, 2N2219A	Q1	1	1		
174		640390	RESISTOR, 220Ω, 2W, 10%	R2	1	1		
175								
176		103787	POT, 1K ½W, 10%	R3	1	1		
177		620475	2.94K, ½W, 1%	R4	1	1		
178		620433	2.05K	R5	1	1		
179		620534	4.64K	R6	1	1		
180		620402	1.96K	R7	1	1		
181		106013	2.2Ω, 10%	R8	2	1		
184		600046	POT, 100Ω, ½W 20%	R11	4	1		
185		610080	150Ω, ½W, 10%	R12	1	1		
186			*2.0 ohm Jumper	R13				
187			S/O — R8	R14				
188		640434	400Ω, 5W, 5%	R15	1	1		
189			S/A R11	R16				
190		640182	7.5Ω, 10W	R17	2	1		
191			S/A R17	R18				
192		640210	10Ω, 5W, 5%	R19	1	1		
193		640140	3.3Ω, 2W, 10%	R20	1	1		

REVISIONS REV	DESCRIPTION

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT
				52542

PLANNER	PREP DATE	SYSTRON DONNER CORPORATION
	10-23-75	
MAT. DUE	CHK'D	SHIPPING ASS'Y
	APP'D	VPH1-40-S7021
B/U REQ.		DRAWING NO.
B/U COMP	USED ON	REF — SIZE P — PART NO. 065132 — REV
		SHEET 6 OF 6

FORM FB-A 11 JUL 75

✳ - INDICATES DEVIATION FROM STANDARD VPH 5-60-M0V

ITEM NO.	MFR	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
		PD27845 (cont)	ASS'Y., COMP. BD.					
004			RESISTOR, S/A R11	R21				
005		101458	1.5K, ½W, 10%	R22	1	1		
006		101467	1K, ↓ ↓	R23	2	1		
007			S/A R11	R24				
008			DELETE	R25				
010		101511	4.7K, ½W, 10%	R27	2	1		
011		101510	6.8K, ↓ ↓	R28	1	1		
012			S/A R23	R29				
013		101508	120Ω, ½W, 5%	R30	1	1		
014			S/A R27	R31				
016		840422	PAD, IC		1	1		
017		840411	, TRANSISTOR		1	R		
018		840420	↓ , ↓		1	R		
020		PD25111	H. SINK #2 ASS'Y + WIRING		1	2		
111		510030	RESISTOR .22 3W 10%	R101 R104	2	1		
112		510155	(1K ½W 1%	R103	1	1		
113		610070	↓ 100Ω ½W 10%	R114	1	1		
115		PD27853	WIRING T101 - L101		1	2		
116		800135	CAP. .1μF 250V	C101 C102	2	1		
117		800364	1.0μF 250V	C103 C104	2	1		
118		710454	DIODE 1N5401	CR101	2	1		
119			S/A CR101	CR102				

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT. 52542
PLANNER	PREP DATE 10-24-72	SYSTRON DONNER CORPORATION		
	CHK'D	SHIPPING ASS'Y		
MAT. DUE	APP'D	VPH1-40-S7021		
B/U REQ.		DRAWING NO.		
		BCD —	SIZE P	PART NO. 065132
B/U COMP		USED ON	SHEET 7 OF 8	

REV. DESCRIPTION

✳ - INDICATES DEVIATION FROM STANDARD VPH 5-60-MOV

ITEM NO.	SYM	PART NUMBER	DESCRIPTION	REFERENCE NO.	ASSY QTY	ACT. CODE	ISS. QTY	SHT QTY
		(CONT)	SHIPPING ASSY		—	—		
27		T942297	HARNESS AC/DC		1	2		
28		PD27846	WIRE LIST					
29		SP536	HARNESS LAYOUT					
30								
31		T942416	HARNESS DC		1	2		
32		PD27091	WIRE LIST (VPH-2)					
33								
35		PD27853	WIRE LIST - JUMPERS		1	2		
36								
37								
38								
39	A		WIRING HARNESS	PD27856				
40	A		WIRING - PC BRD	PD27855	REF	-		
41	A		WIRING - FR PANEL	PD27854	REF	-		
45	B		WIRING - CHASSIS	PD27852	REF	-		
1		935021	METER ASSY 4 VOLT		1	2		
2		[illegible]	LED BASIC IND ASSY	[illegible]	1	1		
3		935037	DIAL	TM-3320-1	1	1		
21		935010	RESISTOR 3.95K 1/2%	1/8 W - 1%	1	1		

MODEL	JOB NO.	LOT QTY	LOT NO.	CODE IDENT 52542
PLANNER	PREP DATE		SYSTRON DONNER CORPORATION	
	CHK'D		SHIPPING ASSY	
MAT. DUE	APP'D		VPH1-40-S7021	
B/U REQ.			DRAWING NO.	
B/U COMP			DEF SIZE PART NO. REV — P 106532	
	USED ON		SHEET 8 OF 8	

REV DESCRIPTION

INSTRUCTION MANUAL

This manual describes the VPH ValuPower Half Rack Series Power Supplies. It contains information of the following:

Model VPH5-60M OV
Model VPH12-35M OV
Model VPH15-31M OV

Model VPH24-22M OV
Model VPH 28-19M OV

Model VPHD15-13M OV

VPH SERIES
VALUPOWER HALF RACK POWER SUPPLIES

MODEL NO.

Copyright © 1975 Systron-Donner Corporation

SYSTRON DONNER

CONCORD INSTRUMENT DIVISION
10 Systron Drive • Concord, California 94518 • U.S.A.
Tel: (415) 676-5000 • TWX: 910-481-9479 • Cable: SYSTRONDONNER

SYSTRON DONNER
INSTRUMENT DIVISION
2727 Systron Drive
Concord, California 94518

WARRANTY POLICY

I Warranty

Systron Donner Instrument Division warrants that at the time of shipment the products manufactured by Systron Donner and sold hereunder will be free from defects in material and workmanship and will conform to the current specifications published by Systron Donner's Instrument Division.

II Warranty

A The warranty period will be one year from the date of shipment. This warranty is extended only to the original buyer.

III Warranty Adjustments

A. If any defect within this warranty appears, Purchaser shall notify Seller immediately.

B Systron Donner agrees to repair or furnish a replacement for, but not install, any product which within the standard warranty shall, upon test and examination by Systron Donner, prove defective within the above warranty period.

C No product will be accepted for return or replacement without prior approval of Systron Donner. Upon such authorization and in accordance with instructions of Systron Donner, the product will be returned to the manufacturing location, shipping charges prepaid by Purchaser.

IV Exclusions from Warranty

A The foregoing warranty is in lieu of and excludes all other expressed or implied warranties of merchantability or fitness or otherwise.

B Systron Donner will not be liable for any special or consequential damages or for loss, damages or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with any other equipment or material, or from any other cause.

C The warranty does not extend to any product manufactured by Systron Donner which has been subjected to misuse, neglect, accident, improper installation or to use in violation of instructions furnished by Systron Donner.

D The warranty does not extend to or apply to any unit which has been repaired or altered at any place other than Systron Donner; by persons not expressly approved by Systron Donner; not to any unit, the serial number of which has been removed or defaced or Changed.

E This warranty applies to new equipment only and will cover repaired or replacement items only to the extent of the balance remaining of the items original warranty period noted in Paragraph II.

F All freight charges will be paid for by the Purchaser.

June, 1985

SYSTRON DONNER
Member THORN EMI Group

INSTRUMENT
DIVISION

2727 Systron Drive, Concord, CA 94518
Phone (415) 676-5000
TWX 910-481-9479

PROPRIETARY RIGHTS STATEMENT

The design information contained herein is the sole property of Systron Donner. The disclosure of this information does not constitute the release of proprietary rights thereof, but is to be used for informational purposes only. Permission to reproduce this information of the product described herein must be obtained in writing from Systron Donner.

Copyright © 1982 Systron Donner
Printed in U.S.A.

TABLE OF CONTENTS

SECTION			PAGE
1	DESCRIPTION		
	1.1	Introduction	1-1
	1.2	Description	1-1
	1.3	General Features	1-1
	1.3.1	Constant Voltage Model	1-2
	1.3.2	Automatic Foldback Current Limiting	1-2
	1.3.3	Remote Programming	1-2
	1.3.4	Adjustable Overvoltage Protection	1-2
	1.4	Precautionary Measures	1-2
	1.4.1	Wire Size	1-2
	1.4.2	Terminal Post Resistance	1-2
	1.5	Specifications	1-3
2	INSTALLATION AND OPERATION		
	2.1	Mechanical Installation	2-1
	2.2	Electrical Connections	2-1
	2.3	Operating Configurations	2-1
	2.4	Controls	2-2
	2.5	Operation	2-4
3	THEORY OF OPERATION		
	3.1	General	3-1
4	CALIBRATION AND MAINTENANCE		
	4.1	General	4-1
	4.2	Test Equipment Required	4-1
	4.3	Calibration Procedure	4-1
	4.4	Maintenance	4-3

LIST OF FIGURES

Figure	2-1	Local Programming/Local Sensing	2-3
	2-2	Remote Programming	2-3
	2-3	Remote Sensing	2-3
	3-1	Block Diagram	3-2
	4-1	Test Equipment Set-up	4-4

LIST OF TABLES

Table	1-1	Specifications	1-3

SECTION I
DESCRIPTION

1.1 INTRODUCTION

The ValuPower Half Rack (VPH) Series Power Supplies are flexible and dependable sources of DC power, which can be used to meet a variety of needs. These needs may range in scope from inspection and production testing, to laboratory bench testing, IC and system applications.

The voltage adjustment range makes these units well suited for specific systems applications. The ability to provide power packaged in minimum space with high reliability and performance meets the demands of most systems requirements.

This instruction manual provides general characteristics and specifications, operating procedures, theory of operation, calibration and maintenance, parts lists and related schematics for the ValuPower Half Rack series Power Supplies Models, VPH5-60M OV, VPH12-35M OV, VPH15-31M OV, VPH24-22M OV, VPH28-19M OV and VPHD15-13M OV.

1.2 DESCRIPTION

The VPH Series is a unique innovation in DC power supply technology. It provides high power output with excellent regulation, low ripple, fast response and low output impedance for powering and protecting sensitive IC's and systems.

The VPH Series units are available in five slot range outputs and one dual output model (VPHD15-13M OV) providing ±11.5 to 15.5 Vdc at 13 amps. All units are half rack, 5-1/4" high for bench or rack mounting with suitable adapters.

This series is multi-versatile for use in either multiple output power systems or in lab applications with optional meters and controls.

For multiple output power applications, the VPH Series is compatible with Trygon's RM521 and RAH-2B rack adapters. These rack confiugrations afford the user the opportunity to mix and match smaller units with different ratings providing a complete system power supply with multiple outputs for various power requirements.

1.3 GENERAL FEATURES

This series features UL Design, low noise for IC and Systems applications, extremely low output impedance, unique self-test output indicator lamp, adjustable current limiting, remote sensing and programming, overvoltage protection, no turn on/turn off transients, positive convection cooling and versatile rack and bench mounting capability for multiple output power. Output, sensing and remote programming terminals are located on the rear panel of the unit. The AC power switch, DC "ON" lamp, voltage control, and appropriate optional metering devices are all located on the front panel.

1.3.1 Constant Voltage Model

A constant voltage is maintained across the output terminals at any preset value within the rated slot voltage range, provided that the load does not draw more than either the rated output current or more than the preset limiting current value determined by the top recessed current control setting.

1.3.2 Automatic Foldback Current Limiting

Short circuit protection is provided by the automatic current limiting circuit which limits the maximum output current under all load conditions. The point at which automatic current limiting occurs is variable and may be selected anywhere between 40% of the rated output current and maximum rated output current of the unit. In the event of an overload, the current and voltage foldback into a safe operating region. In the event of a short circuit, the output current is limited to approximately 40% of the rated current.

1.3.3 Remote Programming

Remote Programming is provided in the voltage mode of operation and may be utilized over the entire voltage range of the unit. The scale factor for remote voltage programming is approximately 500 ohms per volt.

1.3.4 Adjustable Overvoltage Protection

Adjustable overvoltage protection (OV) has a special circuitry which prevents the output from exceeding a preset voltage. An external adjustment control recessed in the top cover is provided to vary the point at which the OV circuit will activate. The overvoltage crowbar will latch when an overvoltage condition occurs and must be reset by cycling the AC input power off and on again. The OV protection point should not be set lower than 1 volt above the minimum power supply voltage rating or 5.5 V minimum.

1.4 PRECAUTIONARY MEASURES

1.4.1 Wire Size

To assure proper regulation under all load conditions and to prevent severe distortions of the AC line voltage, it is very important to take into consideration the physical size and current handling capabilities of the input power line. Serious losses in regulation and an increase in ripple may result from underrated or overloaded AC input lines. The maximum AC impedance from the breaker box to the power supply should not exceed 0.5 ohms.

1.4.2 Terminal Post Resistance

All terminals and shorting links serving outputs, sensing and programming must be securely tightened before use. Serious loss of regulation and an increase in ripple can result due to a voltage drop caused by loose terminals and shorting links.

The specifications cited herein for regulation and ripple can be readily attained on every power supply providing the proper method of measurement is employed. The major consideration is that the highly stable meter and oscilloscope, specified in the calibration procedures, must be connected to the sensing terminals and not the load terminals. The reason for this precaution is that the voltage drop between the load terminals and sensing terminals will yeild an inaccurate regulation ripple measurement.

1.5 SPECIFICATIONS

Table 1-1 is a complete list of standard specifications for the ValuPower Half Rack Power Supplies.

TABLE 1-1 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

Input:	105-132 Vac[1], 57-65 Hz. (200-250 Vac, 47-65 Hz option available)[2].
Output:	Floating; Isolated from ground, 300 Vdc maximum. Internal protection is provided for applied reverse voltage.
Regulation Line:	0.02% for 105-132 Vac line change.
Regulation Load:	0.02% or 5 mV* for no load to full load.
Ripple:	Less than 1 mV RMS; total ripple and noise less than 5 mV p-p +0.05%(to 10 MHz).
Stability:	0.05% +10 mV, for 8 hours after 30 minutes warm-up. Measured at constant line, load and ambient temperature.
Temperature Coefficient (Per°C):	0.02%/°C.
Temperature Range:	-20°C to +71°C.
Temperature Storage:	-55°C to +85°C.
Recovery Time:	50 microseconds to within 30 mV for a Δ1 change as shown in the table.
High Stability (X Option):	0.03%/8 hours. 0.1%/1000 hours. TC 0.01%/°C.
Overload Protection:	A unique patented automatic non-linear current foldback system is incorporated in these units. It is adjustable from 40% to 100% of rated load and affords maximum protection of the series pass regulator while providing maximum reliability should an overload condition occur. (A minimum short circuit current of 10% will be delivered into any class of load, ensuring proper operation with most non-linear loads).

TABLE 1-1 SPECIFICATIONS (Cont'd)

ELECTRICAL SPECIFICATIONS (Cont'd)	
AC Power Input Protection:	Rear panel mounted fuse.
Remote Programming:	Programmable over rated voltage range. Scale factor approximately 500 ohms/volt.
Remote Sensing:	Maintains rated regulation directly at the load. Maximum line drop 0.5 V per leg is included in voltage range. Internal protection is supplied for open sensing leads.
Voltage Adjustment Range:	Continuously adjustable over rated voltage range. Resolution and settability 0.1%.
UL Approval:	Designed to meet UL Recognized Component Index requirement.
GENERAL & PHYSICAL SPECIFICATIONS	
Design Principle:	Prescision Series Pass Regulation.
Operational Modes:	Constant Voltage with Automatic Current Foldback Protection.
Controls:	
Voltage:	Continuous voltage adjustment, front panel screwdriver locking adjust.
Current:	Top recessed adjustment, 40% to 100%.
Input Power:	Front panel AC ON switch (optional)[3].
Output Power:	Front panel DC output indicator.
OV Adjust:	Top recessed adjustment potentiometer.
Metering (Option)[3]:	
Voltage:	Front panel Voltmeter (meter accuracy ±2%).
Current:	Front panel ammeter (meter accuracy ±2%).
Rear Panel Power Output Terminals:	(TB-3) 1/4-20 heavy duty terminals for +V and -V.
Rear Panel Barrier Strip:	(TB-1) (1) AC; (2) Ground G; (3) AC. (TB (TB-4) (1) Negative Output -V; (2) Negative Sensing -S; (3) Remote Voltage Programming RVP: (4) Positive Sensing +S; (5) Positive Output +V.
Systems Rack Mounting Capability:	VPH units without meters can be mounted in Rack Models RPS-8B, RAH-2B or RQH-3B racks for multiple output power are used where meter option is requested. Rack Model RM521 is used for multiple output systems applications where meters and controls are required, external to the unit.

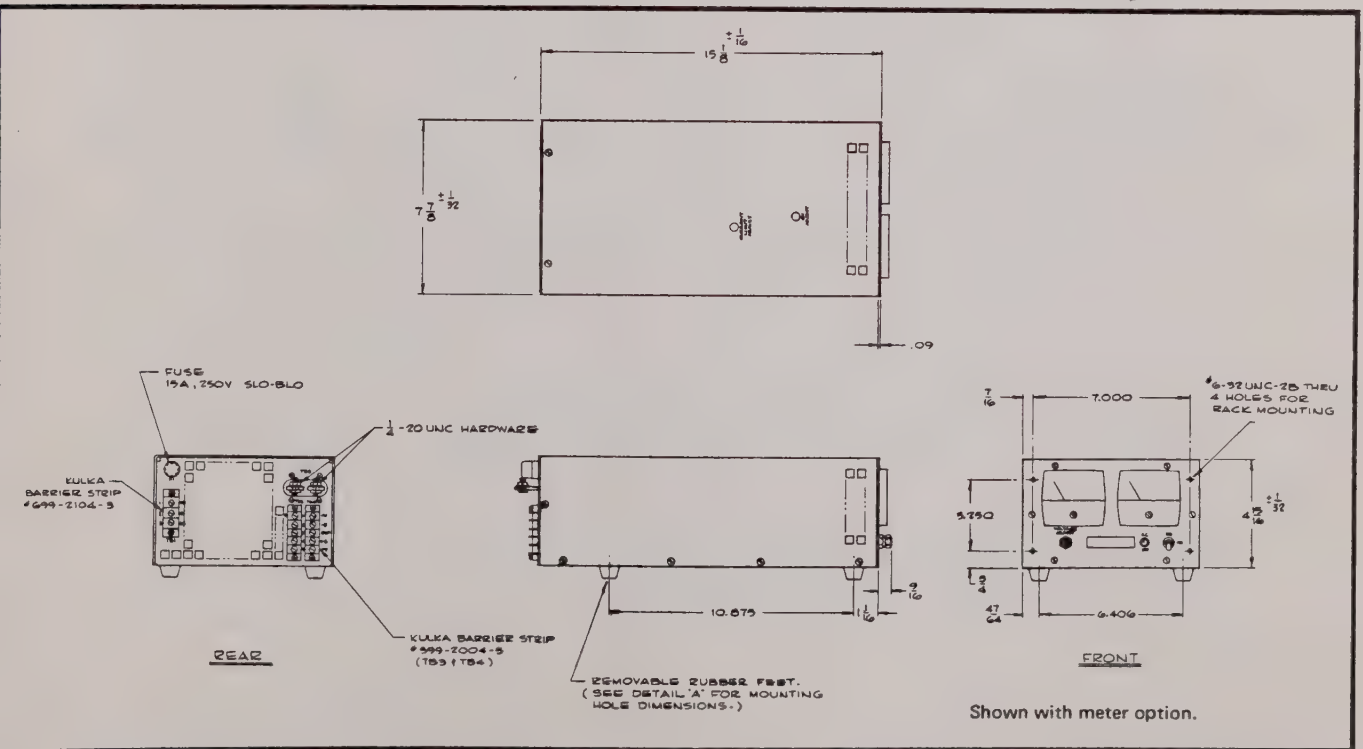
TABLE 1-1 SPECIFICATIONS (Cont'd)

GENERAL & PHYSICAL SPECIFICATIONS (Cont'd)

Overvoltage Protection:	Automatic fast acting, adjustable over-voltage protection available with recessed adjustment.
Dimensions:	5-1/4" x 7-3/4" x 16-1/4".
Weight:	40 lbs.

NOTES: [1]Derate output current 15% for operation above 125 Vac (or 238 Vac).
[2]Derate current 10% or temperature 10 C. Multiply ripply by 2x factor.
[3]When meter option (suffix M) is ordered, unit is provided with four rubber mounting feet for bench use, AC switch and DC output indicator as well as voltage and current meters.

Model	Volts	Max. Amps at Ambient of: 40°C	60°C	71°C	Nominal AC Line Current Rms Amps	Nominal Impedance DC-1 KHz Ohms	Recovery ΔI Amps	Eff* (%)
VPH 5-60 OV**	4.75 to 5.5	60	45	35	8	0.0005	15	40
VPH 12-35	11.0 to 13.0	35	24	20	9	0.001	12	50
VPH 15-31	14.0 to 16.0	31	21	18	9	0.001	10	55
VPH 24-22	23.0 to 26.0	22	15	13	10	0.001	8	57
VPH 28-19	26.0 to 30.0	19	13	11	10	0.001	6	57
VPHD15-13 (Dual)	±11.5 to 15.5	13	9	7.5	7.5	0.001	4	51



Shown with meter option.

SECTION 2

INSTALLATION AND OPERATION

2.1 MECHANICAL INSTALLATION

When the ValuPower Half Rack series power supply is to be used in a rack configuration, rack adapter RAH-2B may be used for either metered or unmetered models. The RAH-2B will accommodate two VPH units side by side. Rack model RM521 can accommodate VPH units intermixed with other modules as well.

For rack mounting, the four rubber feet are removed before placing unit into the rack adapter. The rubber feet provided on all units allow the power supply to be used as a bench supply.

2.2 ELECTRICAL CONNECTIONS

Input Power

A three-terminal barrier strip mounted on the rear panel provides AC input connections to the unit.

The power handling ability of the AC power lines feeding AC power to the unit must be considered, as serious losses in regulation and substantial increase in ripple may occur as a result of insufficient power capacity of these lines. All AC power line connections must be securely tightened and any movable electric contact surface (such as the wiper arm of a variable transformer) should be kept clear of impedance producing oxide coatings.

Care should be exercised in selecting the proper wire size for the AC input lines. The AC wire size should be sufficient so that the line drop does not exceed a value which will allow the input voltage to drop below the specified lower limit of 105 VAC.

An AWG #16 should be adequate for most short runs of 20 ft. or less. Increase wire size to #14 for up to 50 feet and to #12 for up to 100 feet.

Output, Rear Panel

On single output VPH units, main output is provided on two heavy duty terminals. A second auxilliary terminal block is provided for remote sensing and remote programming.

On dual output VPHD units, the negative output, negative remote sensing and remote programming is provided on one terminal block, with positive output, positive remote sensing, and common voltage return and common remote sensing provided on a second terminal block.

2.3 OPERATING CONFIGURATIONS

The ValuPower series power supplies are designed to operate as highly regulated constant voltage sources with automatic foldback current limiting. There are various operating configurations that can be used by proper application of shorting links

2.3 Continued

and wiring. The following paragraphs describe the various operating configurations and their connections.

Local Voltage Programming (Fig. 2-1)

To adjust the output voltage from the power supply, connect a shorting link across terminals 2 and 3. With this shorting link installed, the voltage adjust control provides adjustment of the output over the rated slot voltage range.

Remote Voltage Programming (Fig. 2-2)

Remote voltage programming is achieved by removing the shorting link from terminals 2 and 3 and substituting a resistive element of proper value across terminals 2 and 3 external to the power supply.

Sensing Connections

Local Sensing (Fig. 2-1)

Local sensing connections are made when rated regulation is not required directly at a remote load.

Connect the load to output studs +V and -V, and ascertain that shorting links are connected between terminals 1 and 2 and 4 and 5.

Remote Sensing (Fig. 2-3)

Remote sensing is used when rated regulation is required at a remote load.

Remove the shorting links between terminals 1 and 2 and 4 and 5. Using a twisted, shielded pair of wires, connect the -S (2) and +S (4) sensing terminals to the load. To prevent damage to the power supply, correct polarity of both the remote sensing and output leads must be observed. The negative remote sensing lead (-S) and negative output lead (-V) must be connected to one side of the load and the positive remote sensing lead (+S) and positive output lead (+V) connected to the other side of the load. The shield should be grounded at the power supply end of the cable.

2.4 CONTROLS

Front Panel

AC ON - switch controls power
Voltage Adjust - Potentiometer, Adjusts voltage output.

Top Cover (Recessed Controls)

Current Limit - Potentiometer adjust current limiting point
OV Adjust (option) potentiometer adjust overvoltage protection point in units having this optional feature.

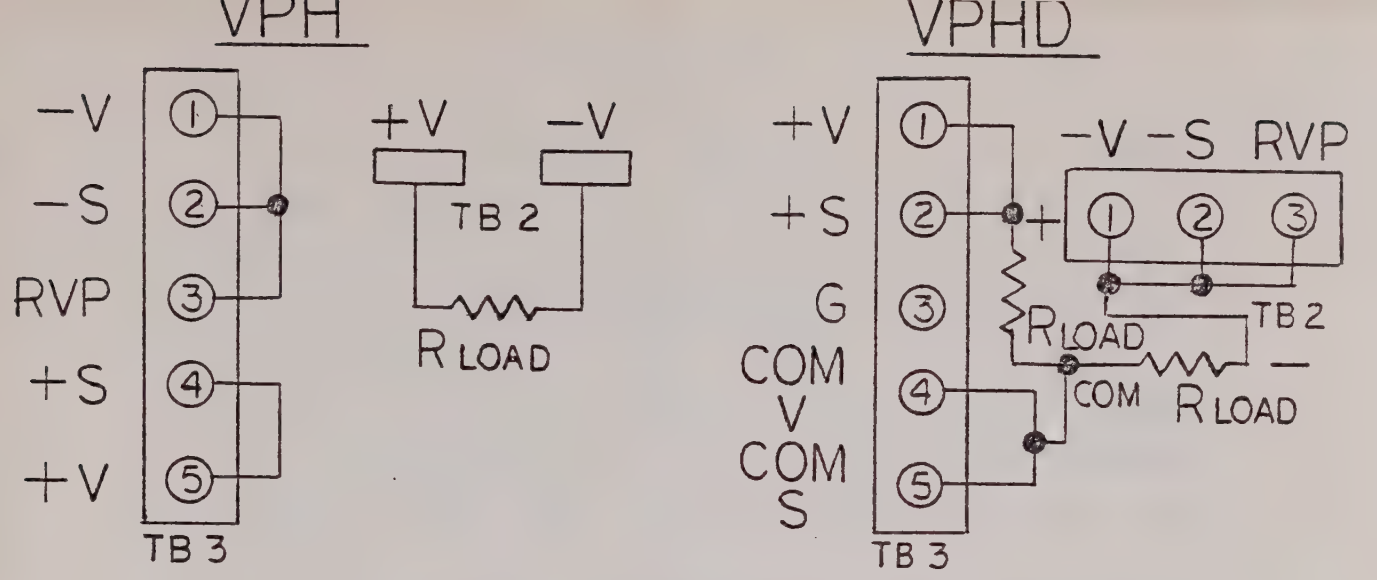


FIG 2-1 LOCAL PROGRAMMING, LOCAL SENSING

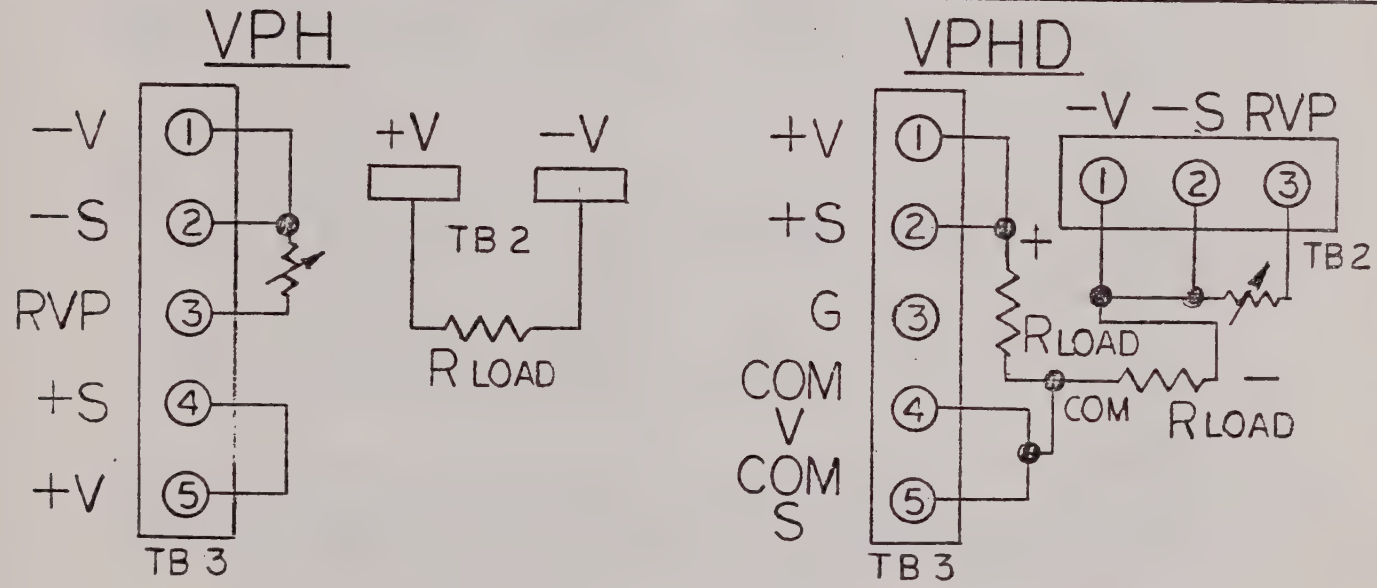


FIG 2-2 REMOTE VOLTAGE PROGRAMMING

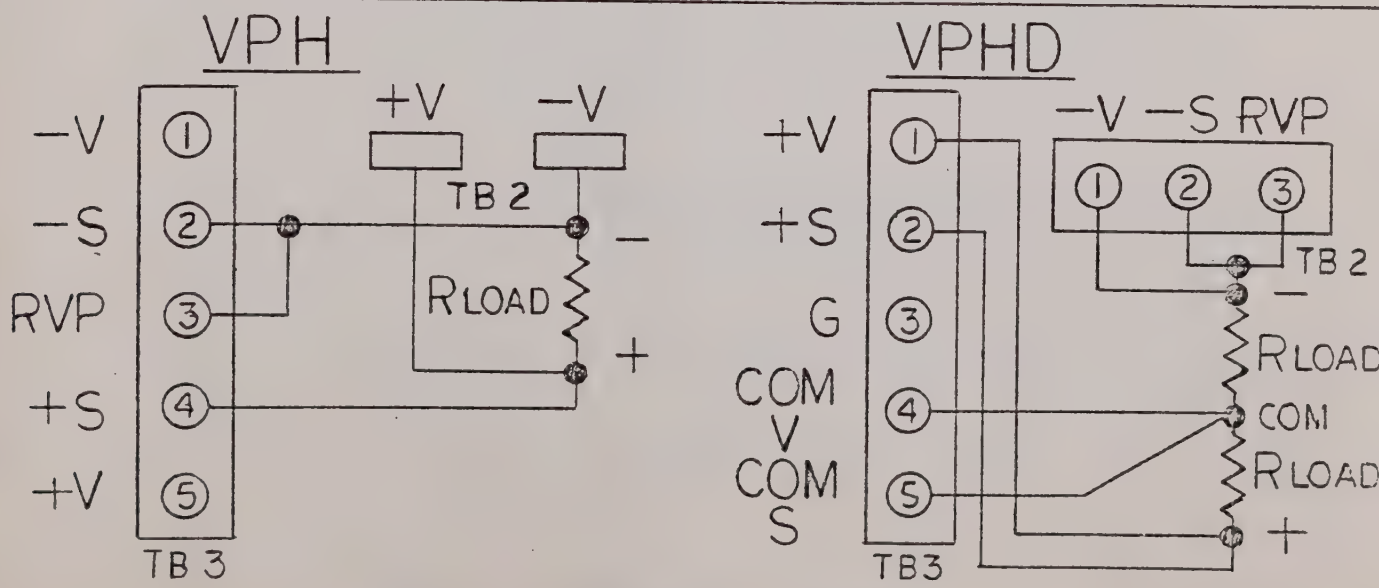


FIG 2-3 REMOTE SENSING

Internal

All internal control settings have been factory preset and require no additional adjusting. However, if it should become necessary to adjust any of the internal controls due to circuit changes caused by component aging or replacement, refer to the calibration section of this manual.

2.5 OPERATION

Control Settings

Set front panel control full CCW, top recessed controls fully CW.

Shorting Links

Prior to the application of power, connect all loads, external wiring and shorting links required for the mode of operation desired.

Grounding

Either side of the output may be grounded, or the output may be used in a floating condition.

Power On

Connect the unit to a nominal AC input power source. Set AC power switch to ON, and observe that pilot lamp is lit.

Warm-Up

No warm-up time is necessary to place the unit into operation. However, a 30 minute warm-up period is recommended to reach rated stability. The unit is now ready for operation.

SECTION 3

THEORY OF OPERATION

3.1 GENERAL

The purpose of the ValuPower series power supplies is to transform and rectify the AC input into a well regulated, stable and adjustable DC output. The following paragraphs describe the major circuits used in the power supply. As each circuit is described, reference should be made to both the Block Diagram, Figure 3-1 and the Schematic Diagram in the rear of this manual.

Primary Input

Input power is obtained through power transformer T101, diodes and filter capacitors. When power switch S101 is set to ON, the output indicator lamp DS 101 glows and AC power is applied to T101 and cooling fan B101. Regulated DC output voltage is immediately available from the power supply.

Series Regulator

The rectified voltage from the diodes and filter capacitors is directed through the Series Pass transistors. The conduction of these transistors is controlled by circuitry which causes them to act as variable resistors. Their overall resistance varies in accordance with the need of the power supply to increase or decrease its output voltage or current. The Series Pass transistors are controlled by driver stages which amplify signals from the Error Amplifier.

Reference Supply, Comparator, Error Amplifier, and Current Limiting

A single integrated circuit, A1, combined the circuitry required to perform the task usually required by many discrete components.

The stable reference voltage is generated and indicated at the circuit reference V REF. When A1 gets the zener regulated voltage across its terminals 5 and P, a precision voltage reference is developed across its terminals 4 and 5. A fixed sample of this voltage is fed into terminal 2 which is one input of the error amplifier.

The voltage which A1 compares the reference voltage to, is fed into terminal 3. Any change in the output voltage is automatically compensated for as the error amplifier generates a correction drive signal at terminal 6 which changes the output voltage accordingly.

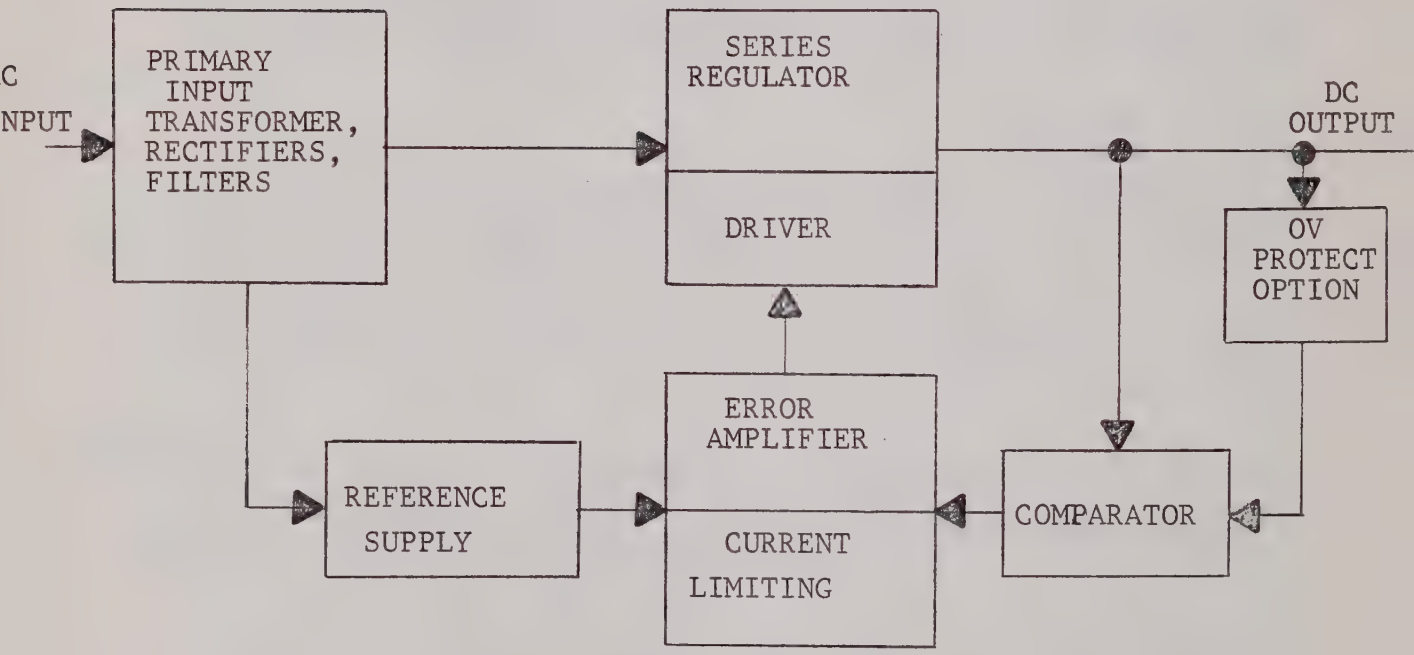
Current limiting is provided by input 10 which will control the error amplifier's output when an overcurrent condition is present.

Terminal A is a compensating input to A1, to insure stability and prevent oscillations under certain load conditions.

3.1 Continued

Overvoltage Circuit (Option)

A sample of the output voltage is developed across R21. This sample is brought to terminal 1 (anode) of the silicon unilateral switch (SUS), which has the characteristics of suddenly conducting when the applied voltage exceeds a minimum threshold. When the SUS conducts it applies a gate signal to the SCR, which crowbars the output to nominal zero.



BLOCK DIAGRAM

FIGURE 3-1

NOTE: The dual output unit uses the negative output as the Master voltage with the positive output circuitry tracking automatically.

SECTION 4

CALIBRATION AND MAINTENANCE

4.1 GENERAL

The following adjustments should be made when necessary to assure optimum operating characteristics and maximum efficiency of the ValuPower series power supplies.

4.2 TEST EQUIPMENT REQUIRED (Or Equivalent)

1. Systron Donner Digital Multimeter Type 9025
2. External Current Shunt (150A rating)
3. Variable Auto transformer, 30 ampere rating

Shorting Link Application

For test purposes shorting links should be connected across rear panel barrier strip terminals 1 and 2, 2 and 3, 4 and 5, and 6 and 7 to provide local sensing and local voltage programming operation. To reduce pickup, shielded wire must be used for all connections between test equipment and the power supply being tested. To prevent ground loops, it is important that only one ground connection be made, as shown in Fig. 4-1. Tighten all terminals as securely as possible and set the front panel control. CW.

4.3 CALIBRATION PROCEDURE

Ammeter Calibration

1. Using a standard ammeter in series with an external load, adjust the load so the unit will operate at its maximum rated current (as indicated on the standard ammeter) and voltage output.
2. Adjust ammeter adjust control (VPH R24, VPHD R45) until ammeter M101 indicates the same current as the standard meter.

Current Limit Test

1. Establish nominal output voltage
2. Set current limit control VPH R11, VPHD R3 fully CW
3. Using an external load, apply a 20% current overload to the unit under test.
4. Adjust current limit control until the overload, as indicated on ammeter MI, is limited to between 5% and 10% (1.05 to 1.10 maximum rated current).

4.3 Continued

Constant Voltage Operation

Load Regulation Test

With the equipment connected as shown in Figure 4-1, connect a suitable load resistance across the output terminal connections. The load resistance selected must be able to dissipate the rated power of the unit (P=IE) and must be of sufficient value to yield the rated output current when the rated voltage is applied. Note the voltage indicated on the Digital Voltmeter. Disconnect the resistive load from the output.

The maximum change in output DC voltage should not exceed by more than .02% or 5mv (whichever is greater) that of the output voltage indicated with the load resistance applied across the output terminals.

Line Regulation Test

Place the resistive load across the output and note the voltage indicated on the DVM. Vary the AC input power 10% above and below the nominal AC input level. The maximum change in output voltage should not exceed by more than ±0.02% or mv (whichever is greater) that of the output voltage measured at either extreme of the AC input.

Ripple Voltage Test

In order to reduce pickup, shielded test leads should be used in making ripple measurements. With the resistive load connected across the output terminals, measure the AC ripple with the AC scale of the DVM. Vary the AC input power 10% above and below the nominal AC input level. The maximum ripple amplitude should not exceed 1mv RMS.

Overvoltage Sensitivity (option) (See Page 4-5 for Dual Unit)

The trigger point of the OV protection circuit is determined by the setting of the OV control R21, located through the top cover. To set the OV circuit to trigger within the output range of the power supply, set R21 CW. Turn on the supply and adjust it for the desired OV firing point. Turn R21 CCW until the output voltage drops as indicated by the voltmeter.

To set the OV circuit to fire at higher output voltage than the output voltage of the supply, a second current limiting type power supply is needed. With the supply under test, set its output voltage to any value. Turn R21 CW and connect the second supply across its output terminals. Set the second supply's output voltage to the desired OV firing point. Turn R21 CCW until the output of the supply drops to a low value as indicated on the voltmeter. This indicates that the OV circuit has fired at the voltage set on the second power supply.

4.4 MAINTENANCE

GENERAL

This power supply is a precision electronic instrument. It is strongly recommended that only experienced troubleshooting personnel perform troubleshooting operations or attempt to repair the unit. If the power supply appears to be malfunctioning at all, the following procedure is recommended for isolating possible defects.

Loads and Interconnections

1. Disconnect all loads and interconnections.

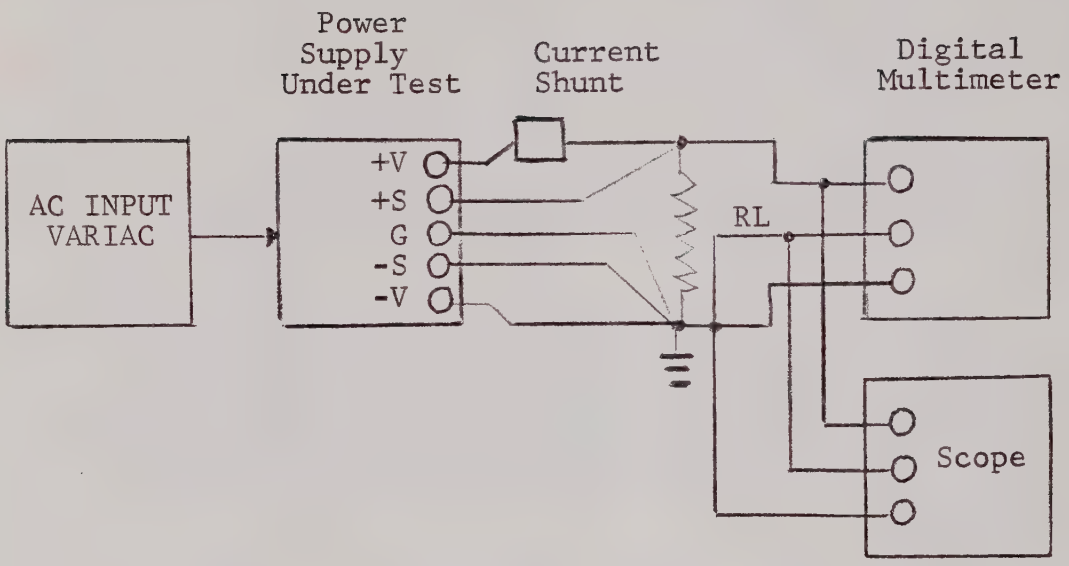
2. Connect a resistive load across the output terminals and operate the unit to determine whether the fault lies within the unit or externally. Observe that shorting links are in place across terminals to provide local sensing operation.

3. Set input voltage to nominal value (115 VAC) and operating controls for rated output. Satisfactory operation at this time would indicate that any malfunction previously encountered, is external in nature. All interconnections and loads normally used in conjunction with this power supply should then be carefully checked for electrical defects.

Troubleshooting

1. Set Voltage Adjust control fully CW. Use a high impedance digital voltmeter to check the voltages across the various circuit components, if shown on the Schematic Diagram located at the rear of this instruction manual. Any sample voltages listed apply only if the unit is operating at its nominal AC input, and has a dummy load of sufficient size connected across its output to allow operation at maximum rated current and voltage output levels. Any reading which is grossly incorrect, indicates that the stage being tested or the one immediately preceding it is defective. The Block Diagram, Schematic Diagram and appropriate sections of the Theory of Operation will prove helpful in any troubleshooting work. Proper polarity to be observed when testing can be easily obtained from the Schematic Diagram.

2. If voltage checks show no noticeable deviations from the prescribed values, disconnect AC power and proceed with point-to-point resistance checks across pots, switches, diodes, resistors, transistors, in that order.



CONSTANT VOLTAGE
OPERATION

TEST EQUIPMENT SET-UP

FIGURE 4-1

ADDENDUM FOR DUAL OUTPUT VPHD

VPHD OVERVOLTAGE PROTECTION

The overvoltage protection provided on the dual output VPHD is one whereby the total voltage of the plus and minus outputs is sensed. The overvoltage trip point is therefore approximately twice that of each individual supply. If either supply should go high in voltage it will cause the overvoltage crowbar to clamp both the plus and minus outputs to nominal zero volts.

The trigger point of the OV protection circuit is determined by the setting of the OV control R21, located through the top cover.

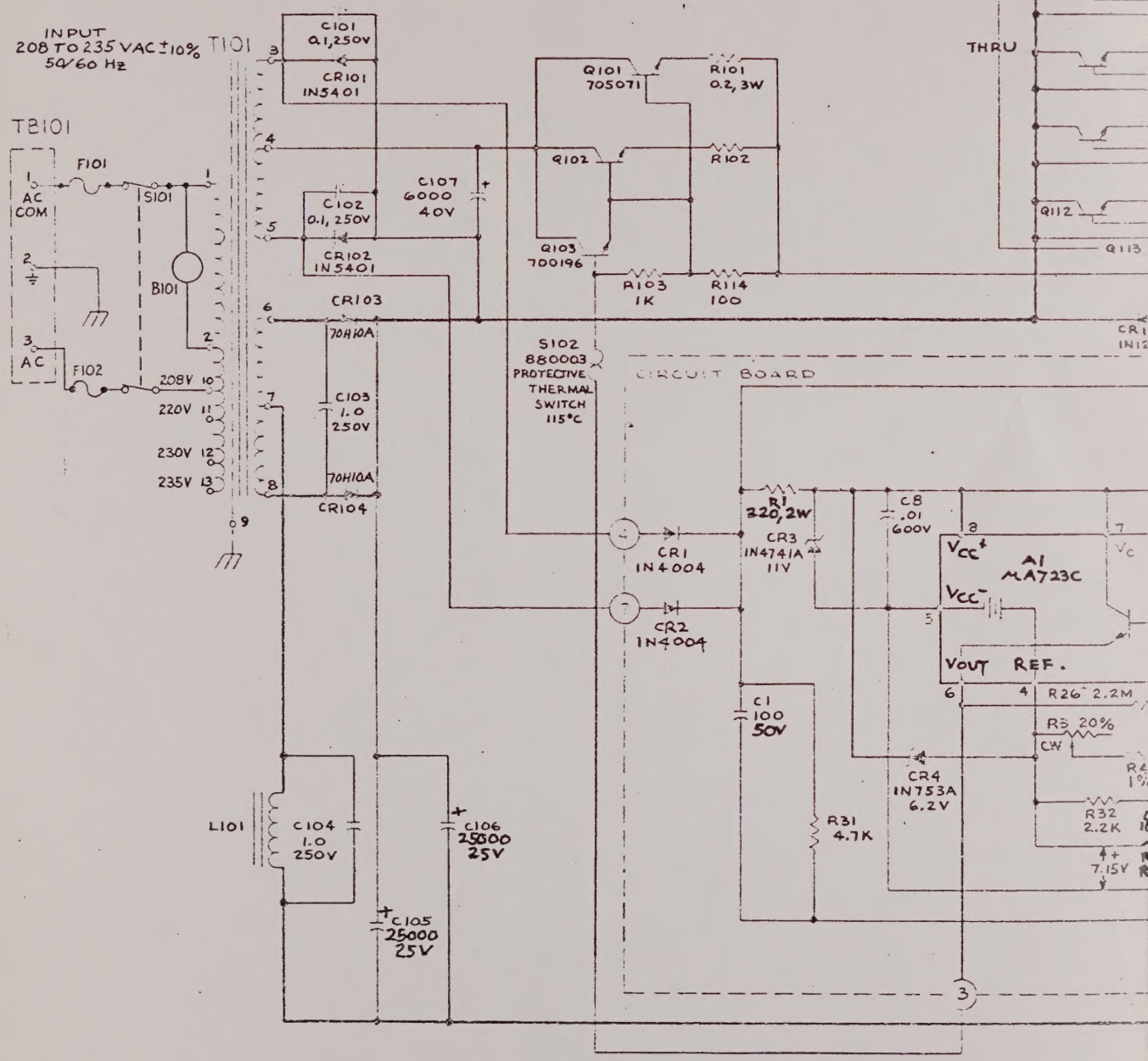
To set the OV circuit to trigger within the output voltage sum of the plus and minus voltages, set R21 CW. Turn on the supply and adjust the negative output voltage (the negative output is the master voltage with the positive output circuitry tracking automatically) for the desired OV firing point. Turn R21 CCW until the output voltage drops as indicated by the voltmeter.

To set the OV circuit to fire at a higher output voltage than the output voltages of the supply will adjust to, a second current limiting type power supply is needed.

Set the supply under test to its desired voltage with R21 turned CW. Connect the second supply across the plus and minus terminals of the supply under test and set its output voltage to the desired OV trip point. Turn R21 slowly CCW until the OV triggers as indicated by the drop in output voltage. This indicates that the OV circuit has fired at the voltage set on the second power supply.

POWER COMPONENT TABLE

MODEL	T101	L101	DS101	Q102	R102	R104-R113	M101	R117 TAP	R116	F101
VPH 1-40 S 7021	504311	504125	OMIT	705071	2Ω 3W	0.15Ω 5W	50A	.0024Ω	500 2W	2A-S.B. 250V
VPH 2-65 S 7017	504311	504125	770090	705071	2Ω 3W	0.1Ω 5W	100A	.0012Ω	500 2W	5A-S.B. 250V
VPH 3-35 S 7022	504318	504177	770090	OMIT	OMIT	0.2Ω 5W	50A	.0024Ω	750 2W	5A-S.B. 250V



VPH 3-35 S 7022	500 1/2 W	2.43K 1%	2.49K 1%	390	750 1/4 W	68	2N3643	270 1/4 W	4.7K 1/4 W	IN4151	10 μfd 10V	6Ω 3W
VPH 2-65 S 7017	500 1/2 W	3.09K 1%	2.49K 1%	330	750 1/4 W	18	2N3643	270 1/4 W	4.7K 1/4 W	IN4151	10 μfd 10V	4Ω 3W
VPH 1-40 S 7021	1K 1/2 W	2.94K 1%	2.05K 1%	270	JUMPER	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT	OMIT
	R3	R4	R5	R12	R13	R25	Q2	R33	R34	CR14, CR15	C14	R17

S	REDRAWN FROM E SIZE				
C	ADDED C14 TO VPH & 3. CHANGED R30 FROM 120Ω TO 47Ω.			7/77	R/B
D	R16 & R17 WAS 7.5Ω 10W			4/79	R/B
E	CR103 & CR104 W.O. P.N. 720458			6/79	R/B
E1	CHANGED S101 TO A DPST, REMOVED CONNECTIONS FROM TB101 TERMINALS 4,5,6		TCO 116	7/80	
F	CHANGED TB1 TO 3 TERM INPUT		ECO 1365	8/80	R/B

TRANSISTORS

R104
R105
THRU
R112
R113
R115
10, 2W

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE 1/2 W ±5%
   RESISTANCE VALUES ARE EXPRESSED IN OHMS.
   CAPACITANCE VALUES ARE EXPRESSED IN MICROFARADS.
2. * DENOTES SELECT AT TEST.

R117
AMMETER SHUNT

TB102

+V

-V

CURRENT LIMIT ADJ.

R14 2.2
R16 100, 20% CW
R11 100, 20% CW
R12
R13
R30 47
Q2
R33
R34
R28 6.8K
C11 200-25V
Q1 2N2219A
C3 .01 600V
CR12 IN 4384
CR14
C14 *
CR15
R24 100 20% CW
M101
R15 400 3W
COMP
C4 470 pf
R8 2.2
R29 1K
R27 4.7K
R19 10, 5W
R18
R17
R20 3.3 2W
R22 1.5K
CR8 IN4384
CR106 C22BF
C108 25000 25V
CR11 IN4148
R5
CR13 IN4384
2 G
A
CR9
C
1
3
2N4990
C7 .05 200V
R23 1K
C9 0.1 100V
CR107 IN1199A
R7 1.96K 1%
2.2V
C13 200 25V
CR7 IN4384
CW R21 100 20%
CR6 IN4384
R25
C5 35, 25V
C6 35, 25V
LED
D3101
DC ON
CW R116 VOLTAGE ADJUST
M102 4V
TB103

PROPRIETARY DATA

SYETRON DONNER CORPORATION CONCORD CALIFORNIA

CODE IDENT 92342

SCHEMATIC
VPH 1-40 S7021
VPH 2-65 S7017
VPH 3-35 S7022

D 065058 F

www.manualsplus.com
1025406